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Are all-encompassing better than one-trait sustainable labels? The influence of Eco-Score and organic labels on food perception and willingness to pay

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ABSTRACT

Front-of-Package (FOP) labels have been used to inform consumers about the nutritional quality, specific attributes, and, more recently, the sustainability impact of food products. For nutritional labels, there is evidence that all-encompassing labels providing a summary score of a product's nutritional quality are effective in influencing consumer behavior, however less is known about the impact of sustainable labels. This research compares an all-encompassing sustainable label summarizing several sustainable product's features into one score, to a one-trait sustainable label focusing on one sustainable attribute. Two controlled online experiments compare an all-encompassing label (i.e., Eco-Score) to a one-trait label (i.e., organic label) and test how their presence influences consumers' willingness to pay. Study 1 (N = 290) shows that a positive all-encompassing sustainable label (Eco-Score B) does not result in a greater willingness to pay for a box of cereal when compared to no label, and to a one-trait sustainable label (organic), even though the Eco-Score incorporates the product's organic attribute in its assessment. Study 2 (N = 577) shows that consumers were willing to pay less for a product featuring an all-encompassing positive Eco-Score label, compared to the same product with an organic label. It also tests a mechanism behind this effect related to the perceived benefits evoked by the label: while the Eco-Score is perceived as only providing environmental benefits, the organic label also provides more concrete health benefits (i.e., it is good for one's health). Implications for public policy are discussed.

1. Introduction

Policymakers worldwide are taking action to tackle climate change (OECD Climate Action, 2022) and consumers are increasingly concerned about the potential adverse environmental effects of their purchases (Borders & Lester, 2019; Kim et al., 2018). In this context, sustainable front-of-package (FOP) labels have become a popular strategy for communicating the environmental impact of products to consumers (De Bauw, Franssens et al., 2022). While there are more than 456 sustainable labels worldwide, consumers often do not know what each label indicates (Yokessa et al., 2020) suggesting the need for research in this area. Although past work has investigated the impact of sustainable labels, the results are mixed regarding their influence on downstream consequences such as consumers' food choices and willingness to pay (Li & Kallas, 2021; Meis-Harris et al., 2021; Potter et al., 2021; Tiboni-Oschilewski et al., 2024; Yokessa et al., 2020). A meta-analysis investigating different sustainable attributes (e.g., environmentally friendly, organic, local, animal-welfare, fair-trade) shows that consumers have higher willingness to pay (WTP) for sustainable products in comparison to conventional ones (Li & Kallas, 2021). Other findings suggest, however, that sustainable claims can lead to fewer sustainable purchases (van der Waal et al., 2022). It is therefore important to investigate what type of sustainable information can positively influence consumers. The present research contributes to this question by investigating how consumers react to an all-encompassing sustainable label that aims to communicate several sustainable attributes simultaneously: the Eco-Score.

The Eco-Score label was launched by actors of the food industry in France in 2021, and then adopted by the French Agency for Ecological Transition (Les Echos, 2021). It portrays the environmental impact of a product in five levels from A (green, very low negative impact) to E (red, very high negative impact). The score takes into account the product's lifecycle assessment (LCA) and other positive (i.e., recyclable packaging, seasonality of food, if the product is fair trade or organic) and negative

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attributes (i.e., a penalty is given if the product contains ingredients causing significant deforestation or makes usage of excess packaging) (Open Food Facts, 2022). The Eco-Score label was initially adopted by food retailers in France (Open Food Facts, 2022), but research on its impact is still scant (De Bauw et al., 2022; De Bauw, Franssens et al., 2022; De Bauw et al., 2021; Weber, 2021; Williams et al., 2023). Importantly, this label is about to be implemented in Europe since a harmonized labelling framework for environment-related food attributes is envisaged by the European Commission (2020).

There are good reasons to believe that all-encompassing sustainable labels will be effective in influencing consumers' food choices. Past research on nutritional FOP labels showed that all-encompassing labels communicating a product's healthiness level are effective in promoting healthy eating because they are simple and easy for consumers to understand (Newman et al., 2016; Werle et al., 2022). FOP nutritional labels simplify consumers' evaluations of a product's healthiness (Dubois et al., 2021), which can be complex, by rating it according to multiple attributes such as calories, fat, sugar, carbohydrates etc. From this perspective, an all-encompassing sustainable label should also be effective because it displays in one single indicator a summarized score including complex attributes, such as production process, origin, animal-welfare, and fair-trade. Empirical evidence suggests that an all-encompassing sustainable label can indeed decrease the environmental impact of participants' food purchases (e.g., Potter et al., 2021). The present research builds upon prior studies by contrasting an all-encompassing sustainable label with a one-trait sustainable label.

Specifically, this research investigates how consumers react to the all-encompassing label Eco-Score and to the one-trait organic label. The organic label refers to a production process excluding artificial fertilizers, chemical pesticides or other additives (De Bauw, Franssens et al., 2022). We decided to focus on the organic label for two reasons. First, it is a well-established sustainable label that has been shown to positively influence consumer behavior (e.g., purchase intention, willingness to pay) compared to the absence of a label (e.g., Janssen & Hamm, 2012) and other one-trait sustainable labels (Li & Kallas, 2021). Second, the all-encompassing label Eco-Score incorporates the organic attribute in its calculation and could therefore act as a substitute for the organic label.

While all-encompassing sustainable labels may simplify consumers' assessment of a product's environmental impact and facilitate decision making, we propose that they may fail to convey product perceptions associated with specific sustainability attributes. Sustainable labels, differ from nutritional quality labels, where all product attributes (e.g., calories, fat, salt) communicate healthiness, and may prompt product perceptions that are specific to one type of sustainable attribute (Hughner et al., 2007; Magnusson et al., 2001; Merle et al., 2016). For example, fair trade labels reflect mainly the fairness of the production process and environmental respect (Hamzaoui-Essoussi & Zahaf, 2011), while organic labels reflect the organic production process and are valued by consumers because such production processes also provide direct benefits for them (e.g., healthiness, higher quality; Hughner et al., 2007; Magnusson et al., 2001). Similarly, local labels can lead to higher purchase intention because consumer perceive local products as healthier, tastier, and more respectful of the environment (Merle et al., 2016). The distinction in the meaning of each sustainable attribute might thus make an all-encompassing sustainable label seem too simplistic and less informative in comparison to one-trait sustainable labels.

The present research proposes that the Eco-Score label will be less effective than the organic label in eliciting favorable assessments of food products and impacting willingness to pay. More specifically, while the organic label could prompt consumers to perceive environmental benefits of the product and also invoke personal health benefits, the all-encompassing Eco-Score label may not effectively communicate specific individual health benefits. Considering that consumers often purchase sustainable products for their self-benefit (e.g., Mai et al., 2021), using all-encompassing sustainable labels can have critical downstream implications, such as a lower willingness to pay for such products (see Fig. 1).

This research makes threefold contributions. First, we contribute to the literature on how sustainable labels influence consumers. Specifically, we extend the limited knowledge about the impact of an all-encompassing sustainable label—the Eco-Score—on consumers' decision-making. Limited research suggests that the Eco-Score is better than no label for promoting environmentally friendly purchases (De Bauw et al., 2021; Potter et al., 2023; Williams et al., 2023). We complement this prior work by demonstrating that a one-trait label presenting a specific sustainable attribute—the organic label—can outperform it. While recent research investigated the impact of presenting the Nutri-Score and Eco-Score labels simultaneously vs. alone (De Bauw et al., 2022; Potter et al., 2023; Williams et al., 2023), knowledge on how consumers differently perceive products with an Eco-Score label and a label presenting a specific sustainable attribute is scant. Second, we add to the knowledge about all-encompassing label usage. While extensive research supports that all-encompassing nutritional labels can be beneficial to convey nutritional quality as they are easier to process and thus help consumers' decision-making (Dubois et al., 2021; Newman et al., 2016; Werle et al., 2022), we propose and demonstrate that all-encompassing labels might not be the best option to convey specific sustainable benefits. Because all-encompassing sustainable labels include attributes that are very diverse—production process, origin, recyclable packaging, fair-trade, etc.—consumers may have difficulty identifying all these different benefits in one single indicator. This research has relevant managerial and public-policy implications as it shows that implementing the Eco-Score label on food products might be sometimes detrimental to consumers' perceptions of products and to market performance.

2. Conceptual background

2.1. Sustainability labels and consumer behavior

Considering consumers' growing concern about the environmental consequences of their consumption choices (Borders & Lester, 2019; Kim et al., 2018), an increasing number of companies are adopting the practice of disclosing the environmental impact of their products (Meijers et al., 2019) through FOP sustainable labels. Sustainable labels can have many forms and meanings. For example, the Marine Stewardship Council label certifies sustainable fishing practices (Le Manach et al., 2020), while the Rainforest Alliance label ensures sustainable agriculture and fair labor practices (Delmas & Clements, 2017). Local labels refer to products that are distributed and consumed close to the place of production (Merle et al., 2016), while organic labels certify that products meet organic farming standards excluding synthetic pesticides and GMOs (Codron et al., 2006). In addition to one-attribute labels, all-encompassing labels can portray multiple-attributes or focus on the product's whole lifecycle or carbon footprint (Tiboni-Oschilewski et al.,

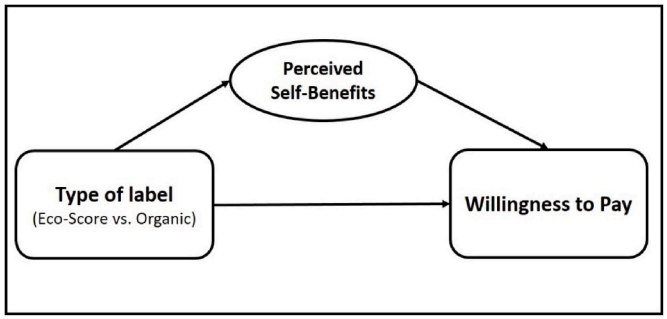

Fig. 1. Conceptual model.

2024). Examples of all-encompassing sustainable labels are the carbon footprint label, which indicates the greenhouse gas emissions associated with a product (Thøgersen & Nielsen, 2016), and the Eco-Score label, which has been suggested by European Union to summarize products' environmental impact (Open Food Facts, 2022).

The comprehension of sustainable labels is essential for their acceptance and usage (Williams et al., 2023). Understanding current sustainability labeling is however, often judged as complex by consumers, who sometimes prefer interpretive labels combining sustainability claims to existing one-attribute sustainability labels (D'Angelo et al., 2020; Sirieix et al., 2011; Vlaeminck,et al., 2014). Arrazat et al. (2023), for example, show that adding a traffic light FOP sustainable label on food products in real supermarkets can increase consumers' awareness about products environmental impact and enhance the purchase of environmentally friendly products. De Bauw et al. (2021) show that adding an Eco-Score along with a Nutri-Score nutritional label leads consumers to make healthier and more environmentally friendly purchases.

However, past research investigating the impact of sustainable labels on consumers (Meis-Harris et al., 2021; Sønderskov & Daugbjerg, 2011; Sörqvist et al., 2015) have revealed mixed findings regarding their effectiveness (Li & Kallas, 2021; Meis-Harris et al., 2021; Potter et al., 2021; Yokessa et al., 2020). On the one hand, meta-analyses (e.g., Bastounis et al., 2021; Li & Kallas, 2021) show that consumers are willing to pay more for products containing sustainable labels in comparison to conventional products. Li and Kallas (2021) demonstrate that consumers would pay, on average, 29% more for a sustainable product. On the other hand, the proliferation of sustainable labels in the market can lead to confusion because consumers might make wrong inferences about what the label stands for due to insufficient knowledge (Grunert, 2011). For example, sustainable labels are often judged as ambiguous about the product's ecological impact and production process (Van Amstel et al., 2008). In addition, consumers find that multiple sustainable labels provide blurred information, as they do not know what the sustainable label specifically represents (Brécard, 2014). Gadema and Oglethorpe (2011) found that 89% of participants were confused when interpreting sustainability labels on carbon footprint due to the large number of labels in the market. Such confusion can decrease consumers' perceived benefit of sustainability labels (Brécard, 2014).

One solution to the challenge of interpreting sustainable labels is to use all-encompassing labels, such as the Eco-Score. This recent sustainability label suggested by the European Union summarizes the product's environmental impact across various dimensions into a single score (Open Food Facts, 2022). Preliminary evidence suggests that consumers choose more nutritious and eco-friendly options when products display the Eco-Score label and a nutritional label (i.e., Nutri-score) (De Bauw et al., 2022; De Bauw et al., 2021). Another study investigating the impact of eco-rankings with varying design complexities found that all-encompassing sustainable labels, similar to the Eco-Score, led to more sustainable product choices compared to eco-rankings that included additional information on transportation and eco-certifications (Weber, 2021). This is because such labels resulted in lower cognitive load, thereby better aiding consumers in their purchase decisions. These findings suggest that an all-encompassing sustainable label can effectively influence consumers, and the literature on FOP nutritional labels presented next supports this evidence.

2.2. *Insights from nutritional FOP labels' research*

Past work on the effectiveness of FOP nutritional labels provides insights into the potential reactions of consumers to all-encompassing sustainable labels. FOP nutritional labels have been applied as a strategy to educate consumers and promote healthier food choices at the moment of purchase (Ikonen et al., 2020). FOP labels, compared to traditional back-of-package labels, provide simpler yet more effective information, as consumers typically spend only a few seconds examining food labels during purchase (Sanjari et al., 2017). Research investigating the impact of nutritional FOP labels on consumer attitudes (Ang et al., 2023; Bialkova et al., 2015; Drichoutis et al., 2005; Grummon et al., 2022; Song et al., 2021) suggests that consumers react differently to labels depending on their presentation on the product package. For instance, Bialkova et al. (2015) demonstrated that nutrition labels and advertising claims significantly influence consumers' evaluations and choices by making nutritional information more accessible and understandable. A systematic review and meta-analysis revealed that color-coded warning nutritional labels effectively guide consumers toward healthier options and discourage unhealthy purchases (Song et al., 2021). This is supported by Grummon et al. (2022), who found that participants exposed to interpretative positive labels for healthy products, negative labels for unhealthy products, or both, made healthier food choices than participants who saw only calorie labels. Furthermore, Ang et al. (2023) emphasized the importance of label credibility, showing that Health Star Rating labels influence consumer perceptions of plant-based foods due to their believability.

Although consumers may find it challenging to interpret FOP nutritional labels (Temple & Fraser, 2014), this can be improved with more straightforward labels that provide summarized information, allowing for rapid evaluation of a food product's nutritional content (Lynam et al., 2011; Möser et al., 2010). Evaluative FOP labels, which summarize the nutritional quality of food products into a single indicator, are particularly effective in promoting behavioral changes, especially when consumers are comparing several products simultaneously (Cadario & Chandon, 2019; Newman et al., 2018; 2016; Werle et al., 2022).

While research on nutritional FOP labels suggests that all-encompassing labels are the most effective, it is noteworthy that all attributes integrated into these labels relate to healthiness. Interpreting a single score of nutritional quality is thus relatively easy for consumers (Fondevila-Gascón et al., 2022; Goiana-da-Silva et al., 2021). Conversely, in the case of an all-encompassing sustainable label this can be more complex, as the different attributes considered in the score might have multiple implications. For example, one dimension could pertain to a manufacturing process following fair trade conditions, another to the origin of the product, or whether its production process adheres to organic rules. Consumers might evaluate these dimensions differently and may have difficulty understanding the final score, unlike with all-encompassing nutritional scores. Research on the complexity of sustainable FOP labels demonstrates that one of the main barriers to adopting sustainable labels is the difficulty in their interpretation (Haider et al., 2022; Thøgersen et al., 2010). Notably, portraying multiple pieces of information on packaging can be detrimental to label performance. For example, Drugova et al. (2020) compared products labeled solely as organic with products labeled as organic alongside additional information like 'low-fat' and 'non-GMO'. Their results indicated that products with the single organic label received better evaluations and higher willingness to pay compared to those with multiple pieces of information, as consumers largely disregarded the additional details. We thus propose that, although the Eco-Score is a simple, all-encompassing FOP label that communicates the overall environmental impact of a product, its attempt to convey multiple pieces of environmental information of a product in the form of a unique visual score might prove detrimental to consumers' product evaluations. Specifically, the product's perceived value might be undermined when displaying the Eco-Score compared to an organic sustainability label that provides a single message and more explicit implications. Specific attributes of labels, such as organic, lead to inferences about food products and their benefits for oneself (e.g., increased perceptions of product healthiness), and as the Eco-Score merges all attributes contributing to a product's environmental impact, it might be challenging for consumers to consider such attributes separately when exposed to the Eco-Score. In other words, we propose that while the Eco-Score is designed to condense the sustainable implications of a product and simplify consumers' evaluation process, its multifaceted

information, encompassing details like energy cost of making a product, carbon dioxide emissions of production, and additional attributes such as 'organic' or 'fairtrade' could overwhelm consumers and compromise their ability to interpret the label effectively. Consequently, this may diminish its influence on product assessment and consumers' willingness to pay.

As we noted previously, while the Eco-Score considers the organic attribute in the rating of a product (i.e., in the form of additional bonus points), such an attribute might not be considered systematically by consumers when it is mixed along with other environmental factors. This research proposes that the Eco-Score may not directly convey to consumers the specific attributes that define the score, such as whether a product is organic or not, negatively affecting consumers' judgment of the product. Based on the personal benefits that specific sustainability labels have for consumers, such as the belief that organic foods are healthier than conventional non-organic foods, consumers should value food products more when they display organic labels. However, because the organic attribute is integrated into the multidimensional Eco-Score label, we propose it may fail to convey the self-benefit perceptions traditionally associated with organic food labels. While the Eco-Score communicates environmental benefits, it may not effectively convey specific personal benefits to consumers. As a result, we predict that individuals will see higher value, reflected in a higher willingness to pay for a product when it portrays an organic label in comparison to when it portrays the Eco-Score label. Replacing the organic label with the Eco-Score may thus mitigate the personal self-benefits associated with the organic label and lead to a lower willingness to pay. More formally, we hypothesize:

H1. Consumers will be willing to pay more for foods with an organic (vs. Eco-Score) label.

2.3. Sustainability labels and consumers motivations

Consumers' motivations to purchase sustainable food products are partly because they are good for society (e.g., supporting the community, reducing personal impact on the environment; Du et al., 2017; Hansen et al., 2018; Kareklaset al., 2014; Yadav & Pathak, 2016), but also because they provide personal benefits (Fotopoulos & Krystallis, 2002; Gundala & Singh, 2021; Hughner et al., 2007; Pew, 2020; Rana & Paul, 2020; Verdeau & Monnery-Patris, 2024). Congruently, consumers perceive sustainability labels better when highlighting personal benefits (Delmas & Grant, 2014). For example, sustainability labels in the wine market were evaluated more favorably when they clearly conveyed both the environmental attributes and the private benefits associated with them (Delmas & Lessem, 2017). When driven by salient health benefits, consumers were willing to pay more for products with a sustainability label (Banerji et al., 2016). Most consumers are willing to pay a premium for pesticide-free foods over conventional food products, and health concerns were strongly linked to this preference (Cranfield & Magnusson, 2003).

The organic label in the European Union restricts the use of pesticides and chemicals and bans GMO foods, aiding the environment and ensuring animal welfare (European Commission, 2007), thus making the organic production process less harmful to the environment. At the same time, these standards of not using additives in agriculture and preventing the use of antibiotics and hormones in animals can make organic foods healthier than non-organic foods (Kareklas et al., 2014). By forbidding antibiotics for animals, GMO foods, and pesticide use and allowing only a few additives to be used in selected conditions, organic food production reduces consumers' concerns about the harm of additives and artificial preservatives used in foods and the process of injecting hormones into animals and feeding them antibiotics (USDA, 2012; Zanoli & Naspetti, 2006). Congruently, it has been shown that consumers' increased knowledge and awareness of food hazards strongly correlate with the increasing consumption of organic food (Magkos et al., 2006; Stobbelaar et al., 2007).

Consumers infer organic food products are healthier because they consider organic food as more natural and less processed than conventional food and they associate its consumption with increased well-being (Chrzan, 2010; Lang & Rodrigues, 2022). Congruently, organic products are associated with a lower risk of diseases such as cancer (Baudry et al., 2018), and a reduced presence of pesticide residues compared to conventional products (Aprile et al., 2012; Baker et al., 2002). Organic products are subject to halo effects (Apaolaza et al., 2017; Küst, 2019), which is a tendency to assess a product as a whole based on only one or a few salient attributes (Beckwith & Lehmann, 1975). This heuristic judgment arises as many individuals use an inference strategy that views objects as consistent with all their characteristics (Nisbett & Wilson, 1977), and thus an observed quality (i.e., organic) can spillover on judgments of other attributes (Chernev, 2007) and decision-making (Bui et al., 2017; Leuthesser et al.,1995; Sundar et al., 2021). For example, organic foods are often erroneously classified as less caloric and providing higher nutrition than non-organic food (Lee et al., 2013). Such inferences support the positive influence of organic labels increasing the appeal of food products (Bezawada & Pauwels, 2013). We thus hypothesize.

H2. Consumers will be willing to pay more for foods with an organic (vs. Eco-Score) label due to an increased perception of self-benefits from the product.

We tested our predictions with two studies. In Study 1, we recruited a sample using the online platform Prolific. For Study 2, we used Amazon Mechanical Turk (MTurk). Both these platforms have been frequently employed for experimental research (Aguinis et al., 2021; Buhrmester et al., 2011; Douglas et al., 2023). Results show that compared to products with no labels, people are willing to pay more for products having an organic label but not more for products with a positive (i.e., grade B) Eco-Score. This effect is mediated by the perception that organic products provide more self-benefits, an association that was not prompted by the Eco-Score label. In our studies, we selected the Eco-Score B to provide a realistic basis for comparison with the organic label which provides sustainability benefits but does not cover all the sustainability dimensions. The Eco-Score B, symbolized by a green leaf, represents a favorable environmental rating, making it a suitable counterpart to the organic label. Both the Eco-Score B and organic label indicate products that have a positive impact on the environment. Conversely, the Eco-Score A represents the highest achievable rating with stringent criteria that are challenging to meet (Open Food Facts, 2022), while the Eco-Score C, depicted by an orange leaf, suggests a lower level of environmental sustainability and may be perceived as failing to meet sustainability expectations.

In Study 1, we tested the main effect of the type of label (control vs. organic vs. Eco-Score) on consumers' willingness to pay using a frequently consumed food product (a cereal box). In Study 2, we again tested consumers' perception of a product (i.e., bread) when it contains an organic label in comparison to when it contains an Eco-Score label. In addition, this study tests the performance of such labels in comparison to a product displaying both the Eco-Score and the organic label. We include the condition with both labels to test if there will be additive effects of the organic label combined with a positive Eco-Score. Study 2 also tests if self-benefits mediate the effect of label type on willingness to pay.

3. Study 1: testing willingness to pay

Study 1 aims to test the main effect of the type of label (organic vs. Eco-Score) on consumers' willingness to pay for a food product (i.e., cereal) that is frequently consumed in the US (Terry et al., 2020). As the USDA organic label is already present in the American market and could thus be more familiar to consumers than the Eco-Score label, we used the European Union organic label (the EU leafsee Table 1) to control for

Table 1
Study 1 stimuli.

Sample size = 290 participants		
Control	Eco-Score	Organic
In grocery stores, the different food products vary in the environmental impact of their production process (eco-friendliness).	In grocery stores, the different food products vary in the environmental impact of their production process (eco-friendliness). Recently, certain products have been labeled according to their eco-friendliness with an Ecoscore. This is the respective label used for that:  Some products have a more positive (or least negative) impact on the environment, and others have a more negative (or least positive) impact on the environment.	In grocery stores, the different food products vary in the environmental impact of their production process (eco-friendliness). Recently, certain products have been labeled according to their eco-friendliness as organic or not. This is the respective organic label to show a product has been certified organic in Europe: 
Some products have a more positive (or least negative) impact on the environment, and others have a more negative (or least positive) impact on the environment. The calculation of eco-friendliness considers the impact of the whole production process.	The calculation of eco-friendliness considers the impact of the whole production process (e.g., water use, organic procedure, CO2 emission). A score of **A** means it has the most positive (or least negative) impact on the environment and score **E** means it has the most negative (or least positive) impact on the environment.	Some products have a more positive (or least negative) impact on the environment, and others have a more negative (or least positive) impact on the environment. The calculation of eco-friendliness considers the impact of the whole production process.
Please take a look at the product below. It is currently available in the UK and is going to be launched in American Supermarkets very soon.	Please take a look at the product below. It is currently available in the UK and is going to be launched in American Supermarkets very soon. The government is using an eco-label Ecoscore that classifies products based on their impact on the environment.	Please take a look at the product below. It is currently available in the UK and is going to be launched in American Supermarkets very soon. The government is using an eco-label that classifies products based on their impact on the environment and more specifically indicates whether they are organic.
Stimuli Images Available Upon Request		

familiarity.

3.1. Participants and procedure

We selected a sample size based on a power analysis in G*Power 3.1.9.7, which showed we would need 252 participants to detect a medium effect size of d = .25 (95% power, alpha = .05) for a study having 3 groups of comparison. We initially recruited three hundred and seven Prolific workers in the US who completed this study in exchange for a monetary reward. When opening the study, participants were informed that they would evaluate a food product as if they were looking at it in a grocery store (participants also saw the respective food product) and failure to display a serious participation (based on completion time and attention checks) will lead to failure to receive payment for participation. While we did not include any exclusion screeners based on participants' dietary patterns (e.g., vegetarians, allergies, eating disorders), five participants failed the attention check and we had 12 missing values for willingness to pay, leaving a final sample of 290 participants (M_{age} = 45.37 years, SD = 16.1; 48.3% males).

Participants were randomly assigned to one of the three label conditions (control vs. organic vs. Eco-Score B) and saw a cereal box with a UK brand. Before indicating their willingness to pay, participants read a short paragraph explaining the respective sustainable label portrayed in the package (organic or Eco-Score B) or saying that products varied in their environmental impact in the control condition (see Table 1 and Web Appendix A). The information about the labels was based on the existing information about the Eco-Score (Open Food Facts, 2022). The description of the Eco-Score used in this study clearly stated that the label calculation considers whether the product is organic. After reading the description of the labels participants saw the cereal box containing either the organic label, the Eco-Score label or no label.

After seeing the cereal product, participants indicated how much they would be willing to pay for it with an open-ended question (i.e., "If you had to purchase this product how much would you be willing to pay for it? Please enter a price you would pay for this product ranging from 1 to 15 dollars"). Participants also answered questions measuring the manipulation check to verify if they had seen an organic label on the product (agree-disagree, 7-point Likert-type scale), an attention check, and personal characteristics (e.g., frequency of purchase of organic products, age; see Web Appendix A).

3.2. Data analysis

The study was conducted using the online platform Qualtrics. All statistical analyses were performed with SPSS Statistics software, version 28. Descriptive statistics were generated for the variables 'Age' and 'Gender'. To test the effects of the independent variable on the dependent variable, a one-way analysis of variance (ANOVA) was used. We also employed an ANOVA to test the effect of the label on our manipulation check consisting of a 7-point Likert scale data. Our decision to use an ANOVA was based on the common practice and previous research validation of using such scales as continuous, thus allowing for the use of parametric tests (Carifio & Perla, 2008). Research supports that Likert scales with 7 or more points approximate interval scales, making ANOVA a robust choice for this type of data (Norman, 2010; Rhemtulla et al., 2012).

3.3. Results and discussion

A one-way ANOVA confirmed that our manipulation worked ($F(2, 287) = 137.915$, $p < .001$). Participants in the organic condition ($M_{organic} = 6.53$) agreed that they saw the organic label more than participants in the control ($M_{control} = 2.58$, $p < .001$) and in the Eco-Score conditions ($M_{eco\_score} = 3.57$, $p < .001$). Participants in the Eco-Score condition also reported seeing an organic label more than participants in the control condition ($p < .001$), which supports that participants in the Eco-Score condition were somewhat aware that the label could portray the organic attribute.

Results show a significant effect of the type of label on willingness to pay ($F(2,287) = 3.291$, $p = .039$). Pairwise comparisons showed willingness to pay for participants in the organic condition was significantly higher than for participants in the control condition ($M_{organic} = 5.02$ vs. $M_{control} = 4.27$, $p = .013$). However, participants in the Eco-Score

(M_{eco_score} = 4.50) condition did not differ in willingness to pay compared to those in the control condition (p = .439). In addition, participants in the organic condition reported marginally higher willingness to pay than participants in the Eco-Score condition (p = .090).

Study 1 findings provide preliminary evidence that consumers are willing to pay more for a product when it portrays an organic label compared to a product with no label, while the presence of an all-encompassing positive Eco-Score label does not generate higher willingness to pay. This study also suggests that the organic label can outperform the Eco-Score label as participants' willingness to pay was marginally higher for those who saw the organic label in comparison to the Eco-Score B label. An additional pilot study with 106 participants (Web Appendix B) compared the impact of adding an organic or an Eco-Score B label for a chocolate bar. Results provide further support that consumers are willing to pay more for a chocolate bar when it portrays an organic ($M_{organic}$ = 6.27) label in comparison to when it displays the Eco-Score B (M_{eco_score} = 5.17; t(104) = 2.213, p = .029) label. This complementary pilot study provides further support for H1 as it shows higher willingness to pay for the organic (vs. Eco-Score) labeled product.

Study 1 findings show that adding an Eco-Score B to a product does not increase participants' willingness to pay for it. These findings add to the mixed results of past research on the impact of sustainable labels (Li & Kallas, 2021; Meis-Harris et al., 2021; Potter et al., 2021; Tiboni-Oschilewski et al., 2024; Yokessa et al., 2020). Reinforcing the findings of Li and Kallas (2021), Study 1's results suggest that the type of sustainable label can differentially influence willingness to pay.

Study 1 findings, however, need to be interpreted with its limitations. First, we did not measure purchase intention in this study, but we did ask participants to imagine a scenario where they had to purchase the product and state the amount they would be willing to pay. This study also did not investigate the psychological process underlying the willingness to pay for organic products. In Study 2, we investigate whether self-benefit perceptions are one of the reasons explaining the increased willingness to pay for organic products in comparison to products with the all-encompassing Eco-Score B label. Study 2 also tests our main model with another utilitarian food product: bread.

4. Study 2: the mediating role of self benefit

In Study 2, we tested our main model using another frequently consumed food product: bread (Meteored, 2023; Statista, 2020). Study 2 aimed to replicate the effect of the type of label on willingness to pay and to provide evidence for the mechanisms underlying consumer preferences for organic labels and positive Eco-Scores, testing H2. We also added a fourth condition that includes both the Eco-Score and the organic labels. We predict that the product displaying the Eco-Score label will again be outperformed by the organic label.

4.1. Participants and procedure

For Study 2 we selected a sample size based on a power analysis in G*Power 3.1.9.7 which showed we would need 280 participants to detect an effect size of d = .25 (95% power, alpha = .05) for a study with four groups of comparison. To account for potential attrition, to increase the robustness of our findings, and improve generalizability, we recruited 603 Mechanical Turk workers based in the US to participate in this study in exchange for a monetary reward, and 580 participants passed the attention check. Similar to study 1, when opening the study, participants were informed that the research consists of a product evaluation, and they would be requested to judge a food product as if they were looking at it in a grocery store. Participants were randomly assigned to one of four conditions: control (i.e., no label), organic label, Eco-Score label, and organic + Eco-Score labels. In each condition, participants were presented with a bread product image with either no label, organic label, Eco-Score label "B" or both organic and the Eco-Score "B" labels. We used the USDA organic logo in this study. As in Study 1, before seeing the product, participants also saw a description providing details about each label or simply informing that products vary in their level of environmental impact (control condition, see Web Appendix C). While we did not use any pre-screeners to exclude participants based on dietary patterns (e.g., vegetarians, allergies, eating disorders), we excluded participants who failed to display a serious participation (based on completion time and attention checks). Specifically, we identified three outliers based on participants' answers to the willingness to pay question (i.e., we standardized this variable and excluded outliers that had Z score values greater than 3.29) (Tabachnick et al., 2013), leaving a final sample of 577 participants (M_{age} = 41.1 years, SD = 13.02; 53.9% males). For a detailed description of the sample demographics and data treatment, see Web Appendix C.

We asked participants to imagine they were at the supermarket choosing products. Participants then indicated their intention to purchase the product ("How likely would you purchase this product? unlikely–very likely"). Next, participants reported how much they would be willing to pay for the product in an open-ended question ("If you had to purchase this product, how much would you be willing to pay for it? Please enter a price you would pay for this product ranging from 1 to 15 dollars"). They then assessed how much benefit the product would provide for themselves (three items, α = .92, "This product is … very bad for my body–very good for my body; very unhealthy–very healthy; very bad for my health–very good for my health") and for others (two items, r = .85, "This product is … not at all respectful of the society–very respectful of the society; not at all respectful of the environment–very respectful of the environment"). To test other potential mechanisms for the label effect we also measured participants' product preferences (four items, α = .92, "This product is a good product, I like this product, This product is attractive, This product is a satisfactory product"- strongly agree–strongly disagree) and taste perceptions (three items, α = .94, "In my opinion the product I was shown earlier is not at all tasty very tasty, not at all pleasurable–very pleasurable, not at all delicious–very delicious"). We then measured the manipulation check ("The product displayed earlier had an organic label on its package", agree-disagree). All variables except WTP were measured with 7-point scales. Finally, we assessed personal characteristics questions (e.g., health consciousness, frequency of purchase of organic products; see Web Appendix C).

4.2. Data analysis

As in Study 1, this study was conducted using the online platform Qualtrics. All statistical analyses were performed with SPSS Statistics software, version 28. Descriptive statistics were generated for the variables 'Age' and 'Gender'. We used a one-way analysis of variance (ANOVA) to test the effects of the independent variable on the variable willingness to pay, perceived self-benefits of the product, perceived benefits to society, as well as manipulation checks. To examine whether the impact of label type on willingness to pay was mediated by perceived benefits of the product, we applied the PROCESS v4.2 plugin in SPSS 28 (Model 4) to test the mediation model.

4.3. Results and discussion

A one-way ANOVA confirmed that our manipulation worked (F(3, 573) = 122.011, p < .001). Participants in the organic condition ($M_{organic}$ = 6.55) agreed that they saw the organic label more than participants in the control ($M_{control}$ = 3.04, p < .001) and the Eco-Score condition (M_{eco_score} = 4.28, p < .001). Interestingly, we also found a marginally significant difference between participants who saw the organic label and those in the organic + Eco-Score condition ($M_{eco\_organic}$ = 6.18, p = .075). Participants in the organic + Eco-Score condition reported seeing the organic label more in comparison to the control (p < .001) and the Eco-Score condition (M_{eco_score} = 4.28, p < .001).

Results show no significant main effect of the type of label on purchase intention (F(3, 573) = 2.440, p > .05). However, similar to Study

1, results show a significant effect of the type of label on willingness to pay (F(3, 573) = 2.712, p = .044). Pairwise comparisons show that willingness to pay for participants in the organic condition was marginally higher than those in the control condition ($M_{control}$ = 4.68, p = .077) and significantly higher than those in the Eco-Score condition ($M_{organic}$ = 5.25 vs. M_{eco_score} = 4.34; p = .005). We found no statistically significant difference between participants in the organic in comparison to participants who saw both organic and Eco-Score labels ($M_{eco\_organic}$ = 4.84, p = .208). Participants in the Eco-Score-only condition did not differ in willingness to pay in comparison to those in the control condition (p = .308), nor to those in the organic + Eco-Score condition (p = .131). We also did not find a difference between the control condition and both labels condition (p = .62), (Fig. 2).

Congruent to our expectations, we found a significant effect of the type of label on self-benefits (F (3,573) = 3.982, p = .008). Pairwise comparisons showed perceptions of self-benefits for participants in the organic condition ($M_{organic}$ = 5.62) were higher than those from participants in the Eco-Score condition (M_{eco_score} = 5.32; t(573) = 2.315, p = .021), in the organic + Eco-Score condition ($M_{eco\_organic}$ = 5.34, p = .027), and those in the control condition ($M_{control}$ = 5.19, p < .001). Participants in the organic + Eco-Score condition did not have any significant difference in perceived self-benefits with participants in control (p = .274) or participants in the Eco-Score only condition (p = .928). Similarly, there were no differences in perceived self-benefits between the Eco-Score only condition and the control condition (p = .313).

We next tested if perceived benefits to the environment vary across conditions. We found a significant effect of the type of label on perceived benefits to the environment (F (3, 573) = 21.545, p < .001). Pairwise comparisons showed that perceived benefits to the environment were significantly higher for the organic condition than for the control condition ($M_{control}$ = 4.90, p < .001) but not different between the Eco-Score condition ($M_{organic}$ = 5.83 vs. M_{eco_score} = 5.64, p = .125) or the organic + Eco-Score condition ($M_{eco\_organic}$ = 5.65, p = .145). Participants in the organic + Eco-Score condition did have a significant difference in perceived benefits to the environment compared with participants in the control condition ($M_{eco\_organic}$ = 5.65 vs. $M_{control}$ = 4.89, p < .001) but not with participants in the Eco-Score only condition (p = .943). Participants in the Eco-Score only condition did have a significant difference in perceived benefits to environment with the control condition (M_{eco_score} = 5.64 vs. $M_{control}$ = 4.89, p < .001).

To test if the type of label's impact on willingness to pay is mediated by the perceived benefits of the product, we conducted a mediation analysis using PROCESS Model 4 (10,000 samples, Hayes, 2017) with type of label as the independent variable (dummy coding with organic label as the reference category), and self-benefit and environment-benefit as mediators predicting willingness to pay. Results show a significant mediation of perceived self-benefit (ab = −.1646, *SE* = .0738, 95% CI = [−.3165,−.0294]), but not of environment benefit (ab = −.0340, *SE* = .032, 95% CI = [−.1076, .0161]) between products having the organic label and products with Eco-Score only. There was also a mediation of self-benefit when comparing the organic label (reference category) with the control condition (ab = −.2373; *SE* = .0837, 95% CI: [−.4202, −.0880]) and when compared with both labels (ab = −.1581; *SE* = .0779, 95% CI: [−.3262, −.0197]). The mediation for the other comparisons was not significant (control vs. Eco-Score: ab = .0726, *SE* = .0760, 95% CI: [−.2314, .0673]; control vs. both labels: ab = .0791, *SE* = .0775, 95% CI: [−.0719, .2364]; Eco-Score vs. both labels: ab = .0065, *SE* = .0729, 95% CI: [−.1449, .1484]).

The mediation through environment benefit was not significant for all comparisons (organic vs. control: ab = −.1650, *SE* = .1069, 95% CI: [−.3814, .0426]; organic vs. both labels: ab = −.0324, *SE* = .0302, 95% CI: [−.1026, .0181]; organic vs. Eco-Score: ab = −.0340, *SE* = .0319, 95% CI: [−.1076, .0161]; control vs. Eco-Score: ab = −.1310, *SE* = .0883, 95% CI: [−.3141, .0325]; control vs. both labels: ab = .1326, *SE* = .0902, 95% CI: [−.0309, .3240]; Eco-Score vs. both labels: ab = .0016, *SE* = .0238, 95% CI: [−.0471, .0552]).

To rule out alternative explanations, we also tested if the type of label influenced product preference or taste perceptions. Results show no effect on product preference ($M_{control}$ = 5.46; $M_{organic}$ = 5.64; M_{eco_score} = 5.58; $M_{eco\_organic}$ = 5.49; F(3, 573) = .961, p > .05) nor taste perceptions ($M_{control}$ = 5.19; $M_{organic}$ = 5.47; M_{eco_score} = 5.29; $M_{eco\_organic}$ = 5.21; F*(3,* 573) = 1.51, p > .05).

Study 2 replicates Study 1 findings using another utilitarian product: bread. Results show that participants had higher willingness to pay for bread when displaying a one-trait sustainable label (organic) in comparison to an all-encompassing sustainable label (Eco-Score). Our findings also provide evidence for the psychological mechanism behind these effects through perceptions of self-benefits, suggesting that a positive Eco-Score fails to convey perceptions of self-benefits in comparison to an organic label and no label. Such judgments could influence consumers' valuation of food products, which can be reflected in their willingness to pay for food items when in the presence of an Eco-Score label. Interestingly, Study 2 findings also demonstrate that participants' judgments of the food and willingness to pay do not differ when presenting both labels together (i.e., organic and Eco-Score) in comparison to only the Eco-Score or no label at all, and these judgments were worse than providing the organic label alone. This finding reinforces previous research using the Eco-Score in combination with Nutri-Score, demonstrating that providing multiple labels concomitantly might compromise consumers' capacity to process the meaning of such labels instead of providing additional effects (De Bauw et al., 2022; De Bauw et al., 2021). One possible reason for this effect is that the presence of two labels simultaneously could prove overly demanding to process, prompting participants to average out the utility each label individually represents (Chernev & Gal, 2010).

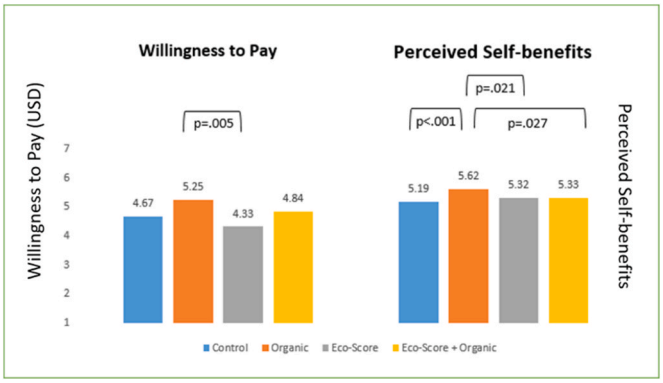

Fig. 2. Willingness to pay & Self-benefits mean values for each condition.

5. General discussion

Interpreting sustainable labels is not easy for consumers (Meis-Harris et al., 2021) as they might not understand what many different sustainability labels stand for (Drugova et al., 2020; Sonntag et al., 2023). While the Eco-Score has recently been proposed and started being tested by many retailers (Agrifood Networks, 2021) as a strategy to facilitate consumers' usage of sustainability labels, the findings of the present research suggest that this all-encompassing sustainable label might not always benefit from the favorable evaluations consumers hold about specific attributes of sustainable products. Specifically, we show that, compared to an organic label, a product with a positive Eco-Score label is perceived as less beneficial to consumers (i.e., less healthy). With that, this research makes three theoretical contributions. First, this research adds to the literature about evaluative all-encompassing FOP labels in general. Previous research on the impact of nutritional FOP labels suggests that consumers may refrain from buying unhealthy products and buy healthy ones when their packaging contains a FOP label (Grummon

et al., 2022; Song et al., 2021). All-encompassing nutritional labels can be easier for consumers to process allowing them to distinguish healthiness level across products (e.g., Werle et al., 2022) and favoring healthy choices (Newman et al., 2016). The present research complements this past work by studying the effect of all-encompassing sustainable labels. Importantly, our findings demonstrate that all-encompassing sustainable labels are not always the most effective to positively influence consumers.

Second, the present research also contributes to the literature on the efficacy of sustainability labels. Past work suggested that highlighting the private benefits of sustainable labels could lead to more favorable product evaluations (Delmas, 2010), something we address directly in the present research by comparing two types of sustainable labels. Past work showed that organic products provide private benefits to consumers such as perceived health benefits, higher perceived safety and superior product quality in comparison to conventional products (Hughner et al., 2007; Kalra et al., 2021; Sundar & Kardes, 2015). While earlier research compared products with organic labels to other conventional foods (Yiridoe et al., 2005), to GMO-free foods (Loureiro & Hine, 2002), or to other sustainability labels, such as 'fair trade' (Meyerding, 2016) and 'local origin' (Migliavada et al., 2022), we compare organic labels to the newly proposed Eco-Score label. Our research thus contributes to the literature comparing the impact of different sustainability labels by showing that consumers are willing to pay more for food products having an organic label when compared with products having a positive Eco-Score label, even though the latter considers the organic attribute in its rating, and this is informed to consumers.

Third, we further add to previous literature, which shows that there is asymmetry between sellers and buyers regarding information conveyed by a sustainability label. As Van Amstel et al. (2008) showed, sustainability labels must communicate the producers' compliance with environmental standards or a product's ecological impact. By only conveying the overall environmental impact, the present research confirms this asymmetry and shows that the Eco-Score fails to convey details of its compliance standards to consumers.

5.1. Managerial and public policy contributions

Our research shows that when specific attributes, such as being organic, are mixed with multiple other product dimensions in an all-encompassing sustainable label, consumers might not factor them into their decision-making. This leads to a lower willingness to pay for organic products carrying a positive Eco-Score. Producers of organic goods will indeed be impacted if their products only carry a positive Eco-Score and do not explicitly state the organic attribute. While a positive Eco-Score highlights the benefits a product provides to the environment, our research shows that the existing organic label also succeeds in conveying the individual benefits of a product. If producers have the choice between displaying a positive Eco-Score or an organic label, the findings of the present research suggest that the latter will be more effective to influence consumers.

When implementing the Eco-Score, marketers of organic products need to ensure the organic attribute remains salient, as consumers may miss it if products display only a positive Eco-Score label. Our findings also show that even when presenting the organic label along with the Eco-Score label, the effectiveness of the label was reduced. This effect could have been driven by increased information complexity (Drugova et al., 2020), preventing consumers from processing the benefits of the organic label. We thus recommend marketers of organic products intending to use the Eco-Score, to ensure the organic attribute remains salient and informed in another manner (e.g., product highlights) to consumers. A strategy could be to highlight the bonus attributes of all-encompassing labels, such as the 'organic' production process.

Our findings provide insights for policymakers given that all-encompassing sustainable labels such as the Eco-Score are being considered for implementation in Europe (Open Food Facts, 2022). The European Union (EU) has proposed a Farm to Fork Strategy to assess various parts of food production and consumption (European Green Deal, 2021; Farm to Fork strategy, 2021). This initiative foresees the development of an EU sustainable labeling framework by 2024. The Eco-Score will likely influence this new sustainability framework proposed in the EU Green Deal (Grayling, 2022). We demonstrate that this label might not always be the best strategy to communicate sustainability for certain types of products. Specifically, as certain sustainable attributes (e.g., organic, local) are associated with a health halo, adding a summarized sustainable score might reduce consumers' positive evaluations of products for which healthiness is determinant and provide benefits to consumers (e.g., food products). Knowing that consumers are willing to pay less for products displaying a positive Eco-Score in comparison to those displaying the organic label, highlights the importance of testing this type of strategy prior to implementation. The comparison between the Eco-Score and organic labels can also be extended in future research to other all-encompassing sustainable labels, such as the Enviroscore in Spain, or the Eco-Impact score in the UK (De Bauw et al., 2022) which also summarize multiple sustainable attributes into a single score.

6. Limitations and future research

The current research is not exempt from limitations. First, in our Study 2 we used an organic logo that contained text. The USDA organic logo contains some text while there is no text in the Eco-Score and this could have affected product perception. Tait et al. (2016) found, in a choice experiment conducted using different label formats, that consumers' perceptions of the nutrient content of food and willingness to pay were sensitive to the label format while comparing text only, text with graphic, and compass format labels (circular or multi-segment labels providing an overall score along with ratings for specific sustainability dimensions). While in Study 1 we show that our effects are also significant for a non-textual organic logo (i.e., European organic leaf), future studies could test if our effect replicates with different formats of organic one-trait labels.

Further, we used self-reported measures and online scenarios, and a field study should aim to replicate these effects in real-world settings measuring behavior. It would be important to assess how one-trait and all-encompassing sustainable labels influence food consumption. Given that the self-benefits assessed in the present research were health-related and healthiness does not always positively affect consumption (Raghunathan et al., 2006; Werle et al., 2013), the effects on consumption may diverge from the ones observed in the present work. Future work is warranted to test how sustainable labels affect actual food consumption.

We used the Eco-Score B consistently throughout our studies. We decided not to include the Eco-Score A in our studies because it represents a very high level of sustainability. It is possible, however, that such a choice influenced our key outcome and that the differences between the organic and the Eco-Score label were due to its rating. Future research is needed to compare different levels of the Eco-Score (A, B and C) to the organic label, but also to other one-trait sustainable labels that are valued by consumers and included in all-encompassing labels, such as the local label (De Bauw, Franssens et al., 2022; Merle et al., 2016).

Lastly, the stimuli used in our studies were utilitarian products (cereal in Study 1 and bread in Study 2). Although our pilot study replicated the main effect of label type on willingness to pay for chocolate, a highly hedonic product, we did not compare such an effect while manipulating product type (hedonic vs. utilitarian). Prior research on FOP nutritional labels showed that whether a product is a vice or a virtue is an important moderator of the effect of label display on consumers' choices (Ikonen et al., 2020). Given that sustainable labels provide benefits that go beyond healthiness, future research should investigate if product healthiness level moderates the effect of sustainable labels on

consumers' perceptions and willingness to pay.

Ethical statement

This research was evaluated by an ethical committee, which approved the project. In all studies, we have informed the participants about the main objective of the study (i.e., assessing food products in a shopping situation) and obtained their consent to participate before any data was collected.

All participants were compensated by their participation in the studies in a monetary way using an online platform. In both studies, participants were allowed to discontinue their participation if they desire.

All information collected was anonymized and used only in a collective way (as observations of a bigger dataset).

CRediT authorship contribution statement

Sumayya Shaikh: Writing – original draft, Methodology, Formal analysis, Data curation, Conceptualization. **Amanda P. Yamim:** Writing – review & editing, Validation, Supervision, Methodology, Formal analysis, Data curation, Conceptualization. **Carolina O.C. Werle:** Writing – review & editing, Validation, Supervision, Methodology, Data curation, Conceptualization.

Declaration of competing interest

The authors declare that there is no conflict of interest. This research was fully funded by the academic institution of the authors.

Data availability

Data will be made available on request.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.appet.2024.107670.

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